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Phytogeographical notes on the Rocky Mountain region

IX. Wooded formations of the Montane Zone of the Southern Rockies

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The Montane or Canadian Zone extends in Central Colorado approximately between the altitudes of 2,500 and 3,000 m. In the upper part of the zone naturally many of the Subalpine plants are common and the lower part has been invaded by those of the foothills and plains. Many of these plants have been omitted in this discussion. As the Montane and Subalpine Zones are predominantly wooded, the plant associations are somewhat similar. In the open lands or grass-formations they are more unlike so far as the composition of the vegetation is concerned, the Montane being more like the plains and mesas of the Submontane Zone, and the Subalpine more like the Alpine Zone.

The principal forest trees of this zone are the following:—bull pine (*Pinus scopulorum*), lodge-pole pine (*P. Murrayana*), limber pine (*P. flexilis*), Douglas fir (*Pseudotsuga mucronata*), Engelmann spruce (*Picea Engelmannii*), Colorado blue spruce (*P. Parryana*), balsam fir (*Abies concolor*), narrow-leaved cottonwood (*Populus angustifolia*), balsam poplar (*P. balsamifera*), western black birch (*Betula fontinalis*), Rocky Mountain alder (*Alnus tenuifolia*), and smooth maple (*Acer glabrum*). These have been discussed in a previous paper.* To these may be added several species of willow, hawthorn, and chokecherry, which

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* Bull. Torrey Club 42: 11–25. 1915.

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belong principally to the foothills. The following wooded formations may be distinguished, though elements of two or more are often mixed.

I. PINE FOREST

This consists mostly of a mixture of *Pinus scopulorum, Apinus flexilis* and *Pseudotsuga mucronata.* In some places, however, one or another of these species is predominant. This formation is limited mostly to the south slopes of the mountains, which are drier and hotter and where the soil is rather poor.

The last one of the three species mentioned seems to be more indifferent, however, to soil and moisture than the others, being found on the north as well as on the south slopes and associating with the pines as well as with the spruces, balsams, and aspens. To the three species are added in the northern part of the Southern Rockies the lodge-pole pine, *Pinus Murrayana.* In some places this forms pure stands, especially on burnt over areas, since it germinates readily and is quick in its growth.

Of the trees belonging to this formation, none is transcontinental or common to the Rockies and the Eastern Canadian Zone, three are common to the Rockies and the Pacific Highlands and one is endemic. Among the shrubs and herbs all four categories are found. As the transcontinentals and the eastern plants act much the same they will be treated together as an eastern element. Those marked "†" are found in the Southern Rockies only, not in the Northern. The nomenclature throughout follows the writer's "Flora of the Rocky Mountains and Adjacent Plains," New York, 1917.

1. Trees

a. Western

Pinus Murrayana
Apinus flexilis
Pseudotsuga mucronata

b. Endemic

Pinus scopulorum

2. Shrubs

a. Eastern or transcontinental

Rubus pubescens
Lepargyraea canadensis

Chamaepericlimenum canadense
Arctostaphylos Uva-ursi
Viburnum pauciflorum
Linnaea americana

b. Western

Odostemon Aquifolium
Ribes viscosissimum
Pachystima Myrsinites
Ceanothus velutinus
Gaultheria humifusa
Arctostaphylos platyphylla†

c. Endemic

Ceanothus Fendleri†
Vaccinium oreophilum

3. HERBS

a. Eastern or transcontinental

Oryzopsis asperifolia
Cinna latifolia
Avena striata
Poa compressa
Streptopus amplexifolius
Coeloglossum bracteatum
Lysiella obtusata
Peramium ophioides
Peramium decipiens
Cytherea bulbosa
Corallorrhiza multiflora
Viola Selkirkii
Viola renifolia
Viola canadensis
Aralia nudicaulis
Moneses uniflora
Pyrola asarifolia
Pyrola elliptica
Pyrola chlorantha
Erxlebenia minor
Ramischia secunda
Monotropa uniflora
Veronica serpyllifolia
Botrychium Lunaria
Botrychium neglectum
Thelypteris Dryopteris
Pteris aquilina

b. Western

Oryzopsis Bloomeri
Poa Olneyae
Piperia unalaschensis
Ophrys nephrophylla
Atragene columbiana
Actaea arguta
Ozomelis stauropetala
Micranthes arguta
Osmorrhiza obtusa
Chimaphila occidentalis
Pyrola picta
Pterospora Andromedea
Razoumofskya americana
Razoumofskya Douglasii
Arnica cordifolia
Hieracium albiflorum

c. Endemic

Stipa Porteri†
Stipa Richardsonii
Calamagrostis Scribneri
Poa tricholepis†
Anticlea coloradensis†
Disporum trachycarpum
Trautvetteria media†
Atragene tenuiloba
Actaea viridiflora†
Ozomelis stenopetala†
Ozomelis Parryi†
Drymocallis fissa
Thermopsis pinetorum†
Thermopsis diversicarpa†
Atelophragma aboriginum
Atelophragma Macounii
Aragallus Richardsonii
Hedysarum boreale
Viola scopulorum
Osmorrhiza intermedia
Primula Parryi
Androsace pinetorum†
Pentstemon secundiflorus†
Pentstemon virens†
Erigeron superbus†
Anaphalis subalpina
Arnica pumila
Arnica sylvatica†
Notholaena Fendleri†
Selaginella Underwoodii†

II. SPRUCE FOREST

This is mostly confined to the north slopes of the mountains, which are much cooler and moister than the south slopes. As in the Subalpine Zone, the principal tree is the Englemann spruce, *Picea Engelmannii*. In some places this forms pure stands but usually it is mixed with the balsam fir, *Abies concolor*, the Colorado blue spruce, *Picea Parryana*, and the Douglas fir, *Pseudotsuga mucronata;* and, in the northern part, sometimes with the lodgepole pine, *Pinus Murrayana*. The undergrowth is much the same as in the Pine Forest, and no attempt has been made to distinguish the undergrowth of the Pine Forest from that of the Spruce Forest.

III. ASPEN GROVES

These are found on richer more gentle slopes, both on the south and the north side of the mountains, but on the former only where there is a certain amount of moisture. The principal tree is the quaking aspen, *Populus tremuloides*, which I count as a transcontinental tree, as the western form, *P. aurea* Tidestrom, is so closely related to the eastern. The trees of the southern Rockies belong evidently to the latter, but in the Northern Rockies it is unknown where the range of one ends and that of the other begins. The vegetation consists mainly of the following plants:

1. Trees and shrubs

a. Eastern and transcontinental

Populus tremuloides
Salix Bebbiana
Betula papyrifera
Rosa Bourgeauiana
Distegia involucrata

b. Western

Salix Scouleriana
Ribes viscosissimum
Rubacer parviflorum
Rubus melanolasius
Sorbus scopulina
Vaccinium scoparium

c. Endemic

Salix perrostrata
Edwinia americana†
Ribes coloradense†
Ribes Wolfii†
Opulaster glabratus†
Sericotheca microphylla†
Rosa Engelmannii
Rosa melina†
Rosa Woodsii
Sambucus microbotrys†
Sambucus melanocarpa

2. Herbs

a. Eastern and transcontinental

Phleum alpinum
Agrostis oreophila
Avena striata
Danthonia spicata
Poa crocata
Bromus Richardsonii
Agropyrum Richardsonii
Vagnera stellata
Ranunculus micranthus
Fragaria americana
Tium alpinum
Viola canadensis
Heracleum lanatum
Aralia nudicaulis
Pedicularis canadensis
Galium boreale
Erigeron droebachiensis
Botrychium simplex
Botrychium neglectum
Botrychium virginianum
Botrychium silaifolium
Polystichum Lonchitis

b. Western

Festuca subulata
Elymus glaucus
Veratrum speciosum
Vagnera amplexicaulis
Vagnera liliacea
Trillium ovatum
Thalictrum sparsiflorum
Aquilegia coerulea
Fragaria bracteata
Geranium viscosissimum

Geranium Richardsonii
Hypericum formosum†
Osmorrhiza obtusa
Glycosma occidentalis
Ligusticum tenuifolium
Pseudocymopterus sylvaticus
Conioselinum scopulorum
Polemonium occidentale
Collinsia parviflora
Pedicularis racemosa
Aster Geyeri
Erigeron macranthus
Erigeron speciosus
Erigeron conspicuus
Achillea lanulosa
Polypodium hesperium

c. Endemic

Stipa Scribneri†
Oryzopsis micrantha
Poa Vaseyana†
Poa longipedunculata
Festuca sororia†
Agropygron Richardsonii
Anticlea coloradensis†
Lilium montanum
Disporum trachycarpum
Alsine Curtisii
Silene Scouleri†
Silene Hallii†
Thalictrum venulosum
Thalictrum megacarpum
Thalictrum Fendleri†
Thalictrum stipitatum†
Viorna Scottii†
Viorna Jonesii
Atragene tenuiloba
Aquilegia elegantula†
Delphinium Barbeyi†
Aconitum columbianum
Sophia incisa
Sophia procera
Heuchera parviflora
Potentilla juncunda
Fragaria glauca
Drymocallis fissa
Sieversia grisea
Sieversia ciliata
Lupinus alpestris
Lupinus pulcherrimus
Lupinus humicola
Atelophragma Macounii
Homalobus oblongifolius†
Aragallus deflexus
Hedysarum marginatum†
Lathyrus laetevirens†
Lathyrus leucanthus†
Lathyrus arizonicus†
Ligusticum Porteri†
Ligusticum brevilobum†
Ligusticum affine
Harbouria trachypleura†
Pseudocymopterus montanus†
Pseudocymopterus tenuifolius†
Pseudocymopterus multifidus†
Conioselinum coloradense†
Polemonium delicatum†
Polemonium Archibaldae†
Polemonium molle†
Polemonium robustum†
Polemonium foliosissimum†
Mertensia ciliata†
Castilleja Crista-galli
Castilleja cognata†

Castilleja confusa
Castilleja rhexifolia
Castilleja trinervis
Pedicularis Parryi
Pedicularis crenulata†
Galium flaviflorum†
Oreochrysum Parryi†
Eucephalus wasatchensis†
Eucephalus glaucus†
Eucephalus formosus†
Aster adscendens
Erigeron yellowstonensis
Erigeron subtrinervis
Antennaria viscidula
Anaphalis subalpina
Helianthella Parryi†
Arnica macilenta†

IV. POPLAR GROVES

These are found in the narrower valleys and cañons, where there is a certain amount of moisture, but where the ground is comparatively well drained. The principal tree is the narrow-leaved poplar or cottonwood, *Populus angustifolia.* Another common tree is *Salix Scouleriana,* and Young* has called this formation the *Populus angustifolia—Salix Nuttallii* Formation.

Another common tree is the smooth maple, *Acer glabrum.* The balsam poplar, *Populus balsamifera,* has been collected in a few places in Colorado, and the canoe birch, *Betula papyrifera* (*B. Andrewsii*), has been collected in one cañon. Some of the evergreens have also partly invaded this formation, as *Pseudotsuga mucronata* and *Abies concolor,* and a few species of hawthorn are found in the lower part of the zone. In the Foothills (Submontane Zone) the narrow-leaved cottonwood is replaced mostly by *Populus acuminata* and *P. Sargentii.* The undershrub and herbaceous vegetation contains many species found in the Aspen Groves.

1. TREES AND SHRUBS

a. Eastern

Populus balsamifera
Salix Bebbiana
Betula papyrifera
Dasiphora fruticosa

b. Western

Pseudotsuga mucronata
Salix Scouleriana
Ribes viscosissimum
Cercocarpus ledifolius
Rubacer parviflorum
Rubus melanolasius

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* Bot. Gaz. **44**: 334–336. 1907.

c. Endemic

Populus angustifolia
Salix lutea
Salix padophylla
Salix perrostrata
Betula fontinalis
Edwinia americana†
Ribes coloradense†
Ribes Wolfii†
Opulaster monogynus†
Opulaster glabratus†
Sericotheca microphylla†
Rosa Engelmannii
Rosa melina
Rosa Woodsii
Sambucus microbotrys†
Sambucus melanocarpa
Sambucus neomexicana†

2. HERBS

a. Eastern or transcontinental

Torresia odorata
Phleum alpinum
Agrostis hyemalis
Calamagrostis canadensis
Dactylis glomerata
Poa crocata
Festuca rubra
Bromus ciliatus
Vagnera stellata
Chenopodium Botrys
Blitum capitatum
Claytonia virginica
Moeringia lateriflora
Moeringia macrophylla
Fragaria americana
Prunella vulgaris
Specularia perfoliata
Aster laevis
Erigeron droebachiensis
Filix fragilis

b. Western

Calamagrostis luxurians
Bromus polyanthus
Elymus glaucus
Ranunculus Douglasii
Ranunculus Bongardi
Aquilegia coerulea
Delphinum Nelsonii
Fragaria bracteata
Drymocallis corymbosa
Thermopsis montana
Lupinus tenellus
Geranium Richardsonii
Geranium viscosissimum
Glycosma occidentalis
Apocynum ambigens
Castilleja lancifolia
Erigeron macranthus
Aster Geyeri
Achillea lanulosa
Senecio pseudaureus

c. Endemic

Poa reflexa
Agropyron Richardsonii
Lilium montanum
Disporum trachycarpum

Chenopodium Fremontii
Silene Scouleri
Thalictrum megacarpum
Atragene tenuiloba
Ranunculus Earlei†
Delphinum robustum†
Delphinum elongatum
Delphinum ramosum†
Sophia leptophylla
Sophia incisa†
Sophia procera†
Fragaria glauca
Lupinus floribundus†
Lupinus parviflorus
Lupinus pulcherrimus
Lupinus humicola
Homalobus tenellus
Lathyrus brachycalyx†
Lathyrus leucanthus†
Lathyrus arizonicus†
Sidalcea candida†
Oxypolis Fendleri†
Apocynum scopulorum
Polemonium foliosissimum†
Hydrophyllum Fendleri†
Agastache pallidiflora†
Agastache urticifolia
Moldavica parviflora
Scrophularia occidentalis
Castilleja Crista-galli
Castilleja rhexifolia
Castilleja sulphurea
Pedicularis Grayi†
Galium flaviflorum†
Valeriana micrantha
Eucephalus glaucus†
Aster ciliomarginatus
Aster adscendens
Erigeron yellowstonensis
Erigeron superbus†
Helianthella quinquenervis
Anaphalis subalpina
Arnica subplumosa

V. ALDER-WILLOW SWAMPS

These are found in the wetter parts of the valleys, where the drainage is rather poor. They contain many of the species found in the preceding formation but also many belonging to the Sedge Bog. The most important woods belonging to the formation are the Rocky Mountain alder, *Alnus tenuifolia*, the western black birch, *Betula fontinalis*, and several species of willows. In the upper part of the zone, the formation becomes more and more like the willow bogs of the Subalpine Zone.*

1. TREES AND SHRUBS

a. Eastern

Salix chlorophylla
Salix cordata

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* See Bull. Torrey Club **44**: 449–450. 1917.

Betula glandulosa
Dasiphora fruticosa
Distegia involucrata

b. Western

Salix Scouleriana
Salix glaucops
Alnus tenuifolia
Kalmia microphylla

c. Endemic

Salix padophylla
Salix monticola
Salix Wolfii
Salix irrorata†
Salix perrostrata
Salix pachnophora†
Salix brachycarpa
Betula fontinalis
Svida instolonea
Negundo Kingii†
Sambucus microbotrys†
Sambucus melanocarpa
Sambucus neomexicana†

2. HERBS

a. Eastern and transcontinental

Calamagrostis canadensis
Panicularia nervata
Eleocharis palustris
Eleocharis acicularis
Streptopus amplexifolius
Alsine alpestris
Alsine crassifolia
Alsine borealis
Sisymbrium Nasturtium-aquaticum
Cardamine pennsylvanica
Geum rivale
Heracleum lanatum
Mimulus moschatus
Veronica americana
Elephantella groenlandica
Senecio pauciflorus
Nabalus racemosus
Equisetum arvense

b. Western

Poa leptocoma
Elymus glaucus
Veratrum speciosum
Limnorchis stricta
Limnorchis viridiflora
Limnorchis borealis
Thalictrum sparsiflorum
Ranunculus Douglasii
Ranunculus Bongardi
Trollius albiflorus
Parnassia fimbriata
Geum oregonense
Circaea pacifica
Mimulus Langsdorfii
Mimulus Lewisii
Pedicularis bracteosa
Galium subbiflorum
Senecio triangularis

Senecio pseudaureus
Athyrium cyclosorum

c. Endemic

Poa reflexa
Panicularia pauciflora
Juncus truncatus
Allium brevistylum
Disporum trachycarpum
Limnorchis purpurascens†
Corallorrhiza ochroleuca
Corallorrhiza Vreelandii†
Rumex subalpinus†
Alsine Curtisii†
Thalictrum megacarpum
Thalictrum Fendleri†
Ranunculus Earlei†
Caltha rotundifolia†
Aconitum columbianum
Cardamine cordifolia†
Cardamine infausta†
Parnassia rivularis†
Geum decurrens†
Sidalcea candida†
Phymosia Crandallii†
Phymosia rivularis
Phymosia grandiflora†
Mertensia ciliata†
Scutellaria Brittoni†
Castilleja sulphurea
Pedicularis Grayii†
Galium flaviflorum†
Aster Canbyi†
Rudbeckia ampla
Senecio nephrophyllus†

VI. COPSES

Besides the shrubby willows included in the preceding formation, there are also shrubberries on dryer ground. These are found partly along the edges of the Aspen and Poplar Groves, the Willow Swamps and even the pinewoods, partly on dryer river-banks, and partly on the hillsides. Though the species of shrubs are not so many, the herbaceous flora associated with them is richer in species than that of either the woods or the meadows. In fact these copses contain many belonging to either and besides many of its own. Many of those belonging mainly to the woods or to the meadows are here omitted.

1. SHRUBS

a. Eastern

Dasiphora fruticosa

b. Western

Cerocarpus ledifolius
Rubacer parviflorum
Rubus melanolasius
Vaccinum scoparium

c. Endemic

Salix perrostrata
Salix brachycarpa
Atragene pseudoalpina†
Edwinia americana†
Edwinia macrocalyx†
Fendlera falcata†
Opulaster monogynus†
Opulaster alternans†
Chamaebatiaria Millefolium†
Sericotheca microphylla
Cercocarpus montanus
Oreobatus deliciosus†
Rosa melina†
Rosa aciculata†
Rosa manca†
Amelanchier oreophila†
Amelanchier Bakeri†
Amelanchier prunifolia†
Ceonothus velutinus
Vaccinium oreophilum

2. HERBS

a. Eastern

Panicum huachucae
Allium sibiricum
Vagnera stellata
Vagnera stellata
Bilderdykia Convolvulus
Moehringia latifolia
Moehringia macrophylla
Vicia trifida
Vicia americana
Xanthoxalis Bushii
Apocynum androsaemifolium
Clinopodium vulgare†
Pedicularis canadensis
Galium boreale
Specularia perfoliata

b. Western

Melica bella
Hesperochloa Kingii
Aquilegia coerulea
Lithophragma bulbifera
Lithophragma parviflora
Drymocallis corymbosa
Drymocallis glandulosa
Lupinus tenellus
Thermopsis montana
Linum Lewisii
Glycosma occidentalis
Apocynum ambigens
Gilia aggregata
Gilia pulchella
Hydrophyllum capitatum
Phacelia sericea
Lappula floribunda
Collinsia parviflora
Castilleja lancifolia
Erigeron macranthus
Balsamorrhiza sagittata
Achillea lanulosa
Artemisia Michauxiana

c. Endemic

Stipa Scribneri†
Orzyopsis micranatha
Poa reflexa
Poa rupicola
Agropyrum Richardsonii
Disporum trachycarpum
Lilium montanum
Polygonum Engelmannii
Silene Scouleri
Atragene pseudoalpina†
Capnoides Brandegei†
Sophia magna†
Sophia andrenarum
Sophia leptostylis†
Draba spectabilis†
Draba Helleriana†
Hesperidanthus linarifolius†
Heuchera bracteata†
Heuchera Hallii†
Heuchera utahensis†
Heuchera parvifolia
Potentilla glaucophylla
Fragaria glauca
Lupinus floribundus†
Lupinus parviflorus
Tium scopulorum†
Homolobus decurrens†
Homolobus tenuifolius
Hedysarum utahense†
Lathyrus laetivirens
Lathyrus leucanthus†
Lathyrus arizonicus†
Viola montanensis
Ligusticum brevilobum†
Amarella heterosepala†
Amarella scopulorum
Dasystephana Parryi†
Phacelia ciliata
Dasystephana affinis
Dasystephana Forwoodii
Apocynum scopulorum
Polemonium albiflorum†
Hydrophyllum Fendleri†
Mertensia lanceolata
Agastache pallidiflora†
Agastache urticifolia
Moldavica parviflora
Scrophularia occidentalis
Penstemon strictus†
Penstemon unilateralis†
Penstemon Rydbergii
Penstemon virens
Penstemon Leonardi†
Penstemon Torreyi†
Castilleja Crista-galli
Castilleja rhexifolia
Pedicularis crenulata
Valeriana trachycarpa†
Valeriana micrantha
Coleosanthus umbellatus†
Coleosanthus albicaulis†
Macronema obtusum†
Eucephalus glaucus
Aster subgriseus†
Aster ciliomarginatus
Aster adscendens
Erigeron incanescens†
Erigeron Smithii
Helianthella Parryi†
Senecio ambrosioides
Senecio multicapitatus†
Heteropleura Fendleri†
Agoseris agrestis†

VII. SAGEBRUSH

To the woody formations may also be added the Sagebrush lands. These are more characteristic of the Submontane Zone, but are also found in the Montane Zone above as well as in the Sonoran below. The most important shrub is *Artemisia tridentata*, which is found in all three zones. So also is *A. cana*, but the other sagebrushes are most common in the higher zones. As the sage lands are open formations, the undergrowth is mostly the same as in the dry valleys and on the tablelands. Only a few plants rather characteristic of this formation will be mentioned.

1. Shrubs

Chrysathamnus filifolius
Artemisia cana
Artemisia tridentata
Artemisia nova
Artemisia tripartita

2. Herbs

Eriogonum cernuum
Penstemon cyathophorus
Penstemon xylus
Penstemon teuchrioides
Castilleja flava

New York Botanical Garden